

he began a new serial, *Cybele Columbiana*, but only one number appeared. His name is commemorated in the genus *Greenella* and in many specific names.—J. N. ROSE, *Smithsonian Institution, Washington, D.C.*

THE POLLINATION OF ASCLEPIAS CRYPTOCERAS

(WITH ONE FIGURE)

Asclepias cryptoceras is one of the largest flowered asclepiads of the Rocky Mountain region, and although it has a large range over Colorado, Utah, Wyoming, and Idaho, it is seldom common. It is not easily for-



gotten when once seen growing on a loose, barren hillside, with its deep red and pale green flowers, with their wonderful fragrance and bizarre form, resembling nothing so much as a jewel in a setting. Because of this peculiarity of structure I propose the vernacular name of "jewel milkweed" as being appropriate. The unusual form is of course due to peculiar insect relations.

The general mechanism of a milkweed flower is well known and a brief recapitulation is all that is necessary here. The asclepiadaceous flower appears externally to consist of the usually reflexed petals and sepals and of the so-called "column," which is surrounded by five "hoods" out of which usually arise five hornlike processes. Between the hoods and on the side of the column are five slits which are usually wedge-shaped, having the larger and open end toward the bottom of the column. The small black bodies which are visible externally at the upper end of the slits are known as corpuscula, and to them are fastened by means of hidden bands the adjacent pollen masses or pollinia of two neighboring anther cells, one on either side of the slit. A corpusculum may be likened to a paper clip and has a wedge-shaped opening on the lower end.

In order that an insect may effect pollination it is necessary for it to wedge its foot in the slit of the column when climbing about over the flower or scrambling to reach the nectar in the hoods. This is usually not a difficult thing to do, and when once it is caught a sharp pull is necessary to extricate the foot. When the insect is free we find, if we examine its leg, a corpusculum firmly fastened to it by means of the cliplike arrangement, and to the corpusculum we find the pollinia attached. If the insect now goes on with its work of gathering nectar, it is usually not long until it is again caught in the slit. This time it draws into it the pollinia previously obtained and with another vigorous pull it breaks the bands connecting the pollinia with the corpusculum and escapes. The pollinia left in the slit are now in contact with the stigmatic surface. By these processes pollination is effected.

The jewel milkweed differs from the typical asclepiad in several important respects. The flowers are nodding instead of erect, and, as a direct adaptation to this, the hoods are closed except for a small opening at the apex; the horn is small and included or hidden within the hood; the lips of the slit are firmly closed, and instead of offering an easy entrance to their trap seem to make the entrance difficult. In many kinds of milkweed the hoods and the upper part of the column are borne on a pedicel several millimeters in length. The hoods are sessile in *Asclepias cryptoceras*.

The pollination of the jewel milkweed, in southwestern Colorado at least, is apparently accomplished by only one species of insect, a huge bumblebee (*Bombus Morrisoni* Cressn.).¹ This huge bee is a full match for the large flower, yet it has a rather difficult time obtaining the nectar. Since the flowers are nodding and since the pedicel is absent, there are no footholds offered, and the bumblebee must continually scramble to keep its position. The hoods guide its feet to the slits, and the bee forces them open, and in order to free itself loosens the corpusculum and drags out the pollinia firmly fastened to its feet. When they dry they are in a convenient position to enter the next slit that chances to open in the bee's scrambling for a foothold.

The fragrance of the flowers is so intense that one would imagine many insects would be attracted, yet such is not the case. In my observation of this plant during the spring of 1914 in southwestern

¹ My thanks are due Professor COCKERELL of the University of Colorado for the determination of this species.

Colorado, I saw but few insects visiting the flowers except the species of bumblebee mentioned. Occasionally a fly or a bee would alight on them, but was capable neither of obtaining nectar nor of dislodging the pollinia. The bumblebees, however, on warm spring days, were actively at work on them; there was no hesitation in their work; they knew where the honey was stored and how to get it. I found pollinia and corpuscula attached to the legs of all bumblebees I caught on *Asclepias cryptoceras*.—
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